

**TITLE : ELECTRIC HEATER WITH A SENSOR
PREVENTING NO-WATER HEATING**

FIELD OF THE INVENTION

This invention relates to an electric heater with a sensor preventing no-water heating, particularly to one provided with a water level probe, a sensing electrode for detecting the water level stored in a water tank on a heater so as to let an electric heating film automatically cut off power, enhancing using safety of an electric heating appliance.

BACKGROUND OF THE INVENTION

An electric oven disclosed in a Taiwan patent of the publicized number 301523 includes a heater made of micro-crystal plane glass coated with a heating film on a lower surface of the glass for producing high heat. But it has a drawback of possible cracking by exterior force, leading to water or electricity leakage and subsequent danger.

Another Taiwan patent of the publicized number 319373 titled "Water heater provided with a heating film" includes a heating chamber made of insulating material, and a heating film provided in the heating chamber, and the insulating material is made of micro-crystal glass, having the same problem and drawback as the case of No. 301523.

Another Taiwan Patent of the publicized number 509453 titled "Electric heating disc" includes a heat-transmitting disc, a heating film member, heat-insulating cotton, and a frame plate. The heating film member produces high heat to be transmitted to the heat-transmitting disc, and is made of an electric heating tube or piece, with the heat-transmitting disc indirectly heated

up, having inferior heat efficiency.

Another Taiwan patent of the publicized number 427500 titled "Heating plate of an electric heater" includes a heating plate made of porcelain, glass and steel and coated with enamel,
5 and a tubular or plate heater is placed in the heating plate, having the problem of inferior heat efficiency.

SUMMARY OF THE INVENTION

The objective of the invention is to offer an electric heater with a sensor preventing no-water heating, by means of
10 automatic cutting off power of the electric heating film with provision of a water level sensor, obtaining using safety of an electric heating appliance.

The invention has the following features.

1. An electric heater with a sensor preventing no-water
15 heating has a heating plate with its lower surface electro-plated with an electric heating film for producing high heat electrically, and transmitted to and by the heating plate to obtain high heating efficiency.

2. An electric heater with a sensor preventing no-water
20 heating has a metal plate fixed on the heating plate for strengthening the upper surface of the heating plate.

3. An electric heater with sensor preventing no-water heating has a water-level probe or a sensing electrode provided on a proper location of the heating plate and extending upward
25 or downward the heating plate to directly detect the water level

in a water tank.

An electric heater with a sensor preventing no-water heating has a temperature sensor and a temperature fuse to perform detection of the water level and controlling of the temperature.

BRIEF DESCRIPTION OF DRAWINGS

This invention will be better understood by referring to the accompanying drawings, wherein:

Figure 1 is a cross-sectional view of a first embodiment of an electric heater in the present invention;

Figure 2 is a cross-sectional view of a second embodiment of an electric heater in the present invention;

Figure 3 is a cross-sectional view of a third embodiment of an electric heater in the present invention;

Figure 4 is a cross-sectional view of a fourth embodiment of an electric heater in the present invention;

Figure 5 is a cross-sectional view of a fifth embodiment of an electric heater in the present invention;

Figure 6 is a cross-sectional view of a sixth embodiment of an electric heater in the present invention;

Figure 7 is a cross-sectional view of an electric heater fixed in one way in the present invention;

Figure 8 is a cross-sectional view of an electric heater fixed in another way in the present invention;

Figure 9 is a cross-sectional view of a seventh

embodiment of an electric heater in the present invention; and,

Figure 10 is a diagram of a control circuit of the electric heater in the present invention.

DETAILED DESCRIPTION OF THE INVENTION

5 A first embodiment of an electric heater with a sensor preventing no-water heating, as shown in Fig. 1, includes a heating plate 1, an electric heating film 2, and a water level probe 3.

 The heating plate 1 is preferably made of micro-crystal
10 plane glass, porcelain, quartz, or electrically insulating material, having a vertical hole 10, and the electric heating film 2 is electro-plated on a lower surface of the heating plate 1, which has at least two silver terminals 20 to connect with wires 21. Then the electric heating film 2 produces high heat by electricity,
15 and the heat generated is to be transmitted to the heating plate 1, so the electric heater can be applied to various heating devices, such as coffee pots, a drinking water dispenser, an electric water heater, etc. Further the water level probe 3 is fitted in the vertical hole 10, or more than one probes 3 may be
20 used if needed. The function of the water level probe 3 is to produce alteration of electric potential to let a signal of that condition to an A/D amplifying circuit 5 as shown in Fig. 10, when the water level moves slowly down from the line A (showing a safe water level and the sensing electrode still not triggering
25 alteration of electric potential) in Fig. 8 and reaches the line B,

that is, the level of few or almost no water, with the water level probe 3 affected by the high heated heating plate 1, as shown in Figs, 8, 9 and 10. Then the A/D amplifying circuit sends a signal to a switch 6 to cut off the electric heating film 2 automatically, thus preventing no-water heating of the heating film 2, enhancing safety in using the heater.

Next. Fig. 2 shows a second embodiment of an electric heater with a sensor preventing no-water heating in the present invention, only differing from the first embodiment in that a metal plate 4 is additionally provided on the heating plate 1, made of steel, iron, aluminum, aluminum alloy, or stainless steel, etc. having high heat transmitting coefficient, most preferably steel also with good shock-enduring feature.

Further, Fig. 3 shows a third embodiment of the invention, different from the first embodiment in that a sensing electrode 3A is additionally attached on a lower surface of the heating plate 1. As shown in Figs. 8, 9 and 10, when the water level is at the line A, a normal water level, the sensing electrode 3A does not trigger to send an output of alteration of electric potential. But when the water level moves down to the line B, an abnormal water level of few water, the sensing electrode 3A may sense alteration of electric potential to feed a signal to the control A/D amplifying circuit 5, which then sends a signal to the switch 6, which then cuts off the heating film 2 automatically, preventing the heating film 2 from heating under no-water condition,

upgrading safety of the heater.

Further, Fig. 4 shows a fourth embodiment of the invention, modified from the third embodiment, only differing from the third one in that a metal plate 4 is additionally
5 provided on the heating plate 1, made of steel, iron, aluminum, aluminum alloy, or stainless steel of high heat transmitting coefficient, above all steel being most preferably even with shock-endurance.

Fig. 5 shows a fifth embodiment of the invention, having
10 the same structure as the first one except that the heating plate 1 has a projection or a recess 10A, where the water level probe 3 and a temperature fuse 3B are received in, functioning as the same as the sensing electrode 3A to detect the water level, to let the heating film 2 automatically cut off power.

Further, Fig. 6 shows a sixth embodiment of the invention,
15 modified from the fifth embodiment, and differing in that a metal plate 4 is additionally provided on the heating plate 1, made of steel, iron, aluminum, aluminum alloy, or stainless steel of high heat transmitting coefficient, above all, steel being most
20 preferable also with high shock-endurance.

Fig. 9 shows a seventh embodiment of the invention, possible to be applied to all the embodiments described above. The seventh one includes a heating cylinder 1A, and a heating film 2 electro-plated on an intermediate portion of the heating
25 cylinder 1A, two silver terminals 2 attached with the heating

film 2 to be connected with wires 21, and a water level probe 3 or an sensing electrode 3A is fixed with the heating cylinder 1A to detect the water level to let the heating film 2 automatically cut off in case of few or no water remained in a water tank on the heating plate, upgrading using safety of the heater.

In short, the electric heater with a sensor preventing no-water heating according to the invention has a heating film directly provided on the heating plate, to heighten heating efficiency, and a water level probe, a sensing electrode or a water level sensor with a temperature fuse to let the heating film automatically cut off power in case of few or no water remained in a water tank on the heating plate, preventing the heater from danger of no-water heating, and upgrading its using safety.

While the preferred embodiments of the invention have been described above, it will be recognized and understood that various modifications may be made therein and the appended claims are intended to cover all such modifications that may fall within the spirit and scope of the invention.